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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/683,977 | 10/10/2003 | Kie Ahn | 501306.01 (30291/US) | 2971 |

7590 05/19/2005

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| EXAMINER | |
|---|---|
| PRENTY, MARK V | |
| **ART UNIT** | **PAPER NUMBER** |
| 2822 | |

DATE MAILED: 05/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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|---|---|---|---|
| ***Office Action Summary*** | **Application No.**<br>10/683,977 | **Applicant(s)**<br>AHN ET AL. | |
| | **Examiner**<br>MARK V. PRENTY | **Art Unit**<br>2822 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *29 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-8,10-14,16-23,25-39,41 and 55-109* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-8,10-14,16-23,25-39,41,66-72 and 80-89* is/are allowed.

6)☒ Claim(s) *55-61,64,65,73,74,77-79,90,91,97-106 and 109* is/are rejected.

7)☒ Claim(s) *62,63,75,76,92-96 and 107-109* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

| | |
|---|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ . |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application (PTO-152) |
| 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____. | 6) ☐ Other: _____. |

This Office Action is in response to the amendment filed on April 29, 2005. That amendment has been entered.

Claim 109 is objected to because it does not further limit independent claim 100, on which it depends. Correction is required (i.e., dependent claim 109 should be canceled).

Claims 55-61, 73, 74, 79, 90, 91, 99-106 and 109 are rejected under 35 U.S.C. 102(e) as being anticipated by newly cited United States Patent Application Publication 2004/0219746 to Vaartstra et al. (Vaartstra).

With respect to independent claim 55, Vaartstra discloses a semiconductor structure (see the entire reference, including the Fig. 1 disclosure) comprising: a substrate material 12 and a composite laminate dielectric layer 28 having a thickness of about 3-18 nm formed on the substrate material, the composite laminate dielectric layer comprising: a layer of $ZrO_2$; and a layer of a lanthanide oxide on the $ZrO_2$ layer (see paragraphs [0085] and [0039], for example).

Claim 55 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 56, Vaartstra's lanthanide oxide is selected from the group of $Pr_2O_3$, $Nd_2O_3$, $Sm_2O_3$, $Gd_2O_3$, $Dy_2O_3$ and PrTixOy (see paragraph [0043]).

Claim 56 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 57, Vaartstra's composite laminate dielectric layer can be a gate dielectric layer of a transistor (see paragraph [0083]).

Claim 57 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 58, Vaartstra's transistor is a component of a DRAM (see paragraph [0002], for example).

Claim 58 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 59, Vaartstra's composite laminate dielectric layer 28 is a dielectric layer of a capacitor 25.

Claim 59 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 60, Vaartstra's capacitor is a component of a DRAM (see paragraph [0002], for example).

Claim 60 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 61, Vaartstra's composite laminate ($ZrO_2$/lanthanide oxide) dielectric layer 28 has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 61 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to independent claim 73, Vaartstra discloses a semiconductor transistor (see the entire reference, including paragraph [0083]) comprising: a gate electrode; a source region and a drain region; and a gate dielectric layer beneath the gate electrode and between the source and the drain regions, the dielectric layer being a composite laminate dielectric layer having a thickness of about 3-18 nm comprising a first layer of $ZrO_2$ and a second layer of lanthanide oxide (see paragraphs [0085] and [0039], for example).

Claim 73 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 74, Vaartstra's composite laminate ($ZrO_2$/lanthanide oxide) dielectric layer has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 74 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 79, Vaartstra's lanthanide oxide is selected from the group of $Pr_2O_3$, $Nd_2O_3$, $Sm_2O_3$, $Gd_2O_3$, $Dy_2O_3$ and PrTixOy (see paragraph [0043]).

Claim 79 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 90, Vaartstra discloses a semiconductor capacitor 25 (see the entire reference, including the Fig. 1 disclosure) comprising: a first electrode 26; a second electrode 32, and a dielectric layer 28 separating the first and the second electrodes, the dielectric layer being a composite laminate dielectric layer having a thickness of about 9 nm comprising a first layer of $ZrO_2$ and a second layer of lanthanide oxide (see paragraphs [0085] and [0039], for example).

Claim 90 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 91, Vaartstra's composite laminate ($ZrO_2$/lanthanide oxide) dielectric layer 28 has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 91 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 99, Vaartstra's lanthanide oxide is selected from the group of $Pr_2O_3$, $Nd_2O_3$, $Sm_2O_3$, $Gd_2O_3$, $Dy_2O_3$ and PrTixOy (see paragraph [0043]).

Claim 99 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to independent claim 100, Vaartstra discloses a semiconductor memory device (see the entire reference, including the Fig. 1 disclosure and paragraph [0002]) comprising: a capacitor 25 that includes a first dielectric material 28 separating a first 26 and a second electrode 32; a transistor that includes a second dielectric material beneath a gate electrode and between a source and a drain region (see paragraphs [0002] and [0083]), and at least one of the first and second dielectric materials is a composite laminate dielectric layer having a thickness of about 3-18 nm comprised of a first layer of material selected from the group consisting of $ZrO_2$ and lanthanide oxide and a second layer of material selected from the group consisting of $ZrO_2$ and a lanthanide oxide on the first layer of material, the second layer of material being different from the first layer of material (see paragraphs [0085] and [0039], for example).

Claim 100 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 101, Vaartstra's lanthanide oxide is selected from the group of $Pr_2O_3$, $Nd_2O_3$, $Sm_2O_3$, $Gd_2O_3$, $Dy_2O_3$ and PrTixOy (see paragraph [0043]).

Claim 101 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 102, Vaartstra's first (capacitor) dielectric material 28 is comprised of the composite laminate dielectric layer.

Claim 102 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 103, Vaartstra's second (gate) dielectric material is comprised of the composite laminate dielectric layer (see paragraph [0083]).

Claim 103 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 104, each of Vaartstra's first (capacitor) and second (gate) dielectric material is comprised of the composite laminate dielectric layer (see paragraph [0083]).

Claim 104 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 105, Vaartstra device is a DRAM (see paragraph [0002]).

Claim 105 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 106, Vaartstra's composite laminate ($ZrO_2$/lanthanide oxide) dielectric layer has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 106 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

With respect to dependent claim 109, Vaartstra's composite laminate dielectric layer has a thickness of about 3-18 nm (see paragraph [0085]).

Claim 109 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra.

Claims 64 and 65 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over newly cited United States Patent Application Publication 2004/0219746 to Vaartstra et al. (Vaartstra). Specifically, claims 64 and 65 depend on independent claim 55, which is rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra (see above). The above explanation of the rejection of independent claim 55 under 35 U.S.C. 102(e) as being anticipated by Vaartstra is hereby incorporated by reference into this rejection of dependent claims 64 and 65 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vaartstra. The difference, therefore, between device claims 64 and 65 and Vaartstra's device is a process one (i.e., claims 64 and 65 recite that independent device claim 55's $ZrO_2$ and lanthanide oxide layers are formed by certain processes). Insofar as claim 64's and claim 65's $ZrO_2$ and lanthanide oxide layers appear to be structurally the same as or similar to Vaartstra's $ZrO_2$ and lanthanide oxide layers (in view of their similar use, for example), claims 64 and 65 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vaartstra. See MPEP 2113.

Claims 77 and 78 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over newly cited United States Patent Application Publication 2004/0219746 to Vaartstra et al. (Vaartstra). Specifically, claims 77 and 78 depend on independent claim 73, which is rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra (see above). The above explanation of the rejection of independent claim 73 under 35 U.S.C. 102(e) as being anticipated by Vaartstra is hereby incorporated by reference into this rejection of dependent claims 77 and 78 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vaartstra. The difference, therefore, between device claims 77 and 78 and Vaartstra's device is a process one (i.e., claims 77 and 78 recite that independent device claim 73's $ZrO_2$ and lanthanide oxide layers are formed by certain processes). Insofar as claim 77's and claim 78's $ZrO_2$ and lanthanide oxide layers appear to be structurally the same as or similar to Vaartstra's $ZrO_2$ and lanthanide oxide layers (in view of their similar use, for example), claims 77 and 78 are rejected under 35

U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vaartstra. See MPEP 2113.

Claims 97 and 98 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over newly cited United States Patent Application Publication 2004/0219746 to Vaartstra et al. (Vaartstra). Specifically, claims 97 and 98 depend on independent claim 90, which is rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra (see above). The above explanation of the rejection of independent claim 90 under 35 U.S.C. 102(e) as being anticipated by Vaartstra is hereby incorporated by reference into this rejection of dependent claims 97 and 98 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vaartstra. The difference, therefore, between device claims 97 and 98 and Vaartstra's device is a process one (i.e., claims 97 and 98 recite that independent device claim 90 $ZrO_2$ and lanthanide oxide layers are formed by certain processes). Insofar as claim 97's and claim 98's $ZrO_2$ and lanthanide oxide layers appear to be structurally the same as or similar to Vaartstra's $ZrO_2$ and lanthanide oxide layers (in view of their similar use, for example), claims 97 and 98 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vaartstra. See MPEP 2113.

Claims 62, 63, 75, 76, 92-96, 107 and 108 are objected to as being dependent upon a rejected base claim, but would be allowable over the prior art of record if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 1-8, 10-14, 16-23, 25-39, 41, 66-72 and 80-89 are allowable over the prior art of record.

The prior art of record does not disclose or suggest the allowable semiconductor devices taken as a whole, including the composite laminate dielectric layer.

United States Patent Application Publication 2005/0077519 is related to this application.

Registered practitioners can telephone the examiner at (571) 272-1843. Any voicemail message left for the examiner must include the name and registration number of the registered practitioner calling, and the Application/Control (Serial) Number. Technology Center 2800's general telephone number is (571) 272-2800.

Mark Prenty

**Mark V. Prenty**
**Primary Examiner**